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TO WHAT EXTENT IS IT POSSIBLE TO INTRODUCE INTO THE HIGH-SCHOOL COURSE IN PHYSICS A STUDY OF THE PRACTICAL APPLICATIONS OF PHYSICS TO INDUSTRY

E. G., THE CONSTRUCTION AND OPERATION OF STEAM, GAS, AND TURBINE ENGINES, WATER WHEELS, HYDRAULIC PRESSES, ELEVATORS, ARTIFICIAL-ICE AND LIQUID-AIR MACHINES, TELEPHONE AND TELEGRAPH SYSTEMS, LIGHTING AND POWER PLANTS, ETC.?

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Without discussing the advisability of introducing such study into a course in physics further than to state that the pupil of high-school age is more interested in the cause of the many mysteries about him, and the secret of machinery, than he is in learning the mathematical relation of effect to cause, I am free to admit that I believe it advisable to leave out much which we now teach, and to devote the time to the study of the industrial phase of physics. This can be done in the class or lecture-room, in the laboratory, and by trips to factories and plants.

In the textbook work the laws of falling bodies may and should be treated under the topic of accelerated motion. The very fact that this subject is treated under a separate heading tends toward confusion, as the pupil will not see that *g* is only a special case of *a*. Gravity should be considered and treated only as one of the forces of nature, and co-ordinate with the pull of a horse to a plow, the pull of an engine, the force of a friction brake, etc. The inclined plane, the pile-driver, the coasting sled, and the gravity switch furnish good material to arouse interest.

Curvilinear motion should be considered in the lecture-room, but not from a mathematical standpoint. Pupils relish knowing why grindstones and fly-wheels sometimes burst, why objects weigh less at the equator than at the poles, and why the equatorial diameter of the earth is greater than the polar diameter. But as soon as it is attempted to demonstrate, in the short time allotted to both student

and teacher, that $f=\frac{mv^2}{r}$, the interest of 90 per cent. of the class will die instanter.

Work and energy should be taught with a concrete example of something doing work before the class. Abstract considerations such as $E=\frac{1}{2}mv^2$ or $E=\frac{wv^2}{2g}$ mean little or nothing to most of the class; therefore little stress should be put upon it. Why not leave such material for the college student. He who does not go to college will never think of using it.

Simple harmonic motion is another term that is liable to bewilder instead of enlighten. The students have seen wave-motion and vibratory motion, but simple harmonic motion is too much out of their experience to be appreciated.

In light, much time can be spent in tracing rays through lenses which should be given to the study of phenomena that need reproduction and explanation. The pupil will forget and never use the mathematical formula given him; but the phenomena he has with him always.

In heat, a common fault is to require many problems on mixtures involving heat of fusion, heat of vaporization, and specific heat. These problems are rich and interesting to those who are able to grasp their full significance. To keep the student on them, however, until he can handle and appreciate their value is to rob him of much he should know. Instead of such work, why not have him calculate the amount of coal to run a boat across the lake, having given the resistance of the boat, the efficiency of the engine, and the heat equivalent of a pound of coal; or similar problems? It smacks of something useful, something taken from the real commercial life.

In electricity, the common devices and machines which one meets at every hand should be minutely studied. They should be handled, dissected, constructed, if possible. The greatest mystery of the age to most people is the dynamo.

In the laboratory it is well to have the question in each experiment so definite and concrete that it is impossible for the student to lose sight of the main point. And I find it convenient and profitable to have a list of optional experiments primarily for students who are able to do more than required work. However, in many cases I

permit the class to choose optional for regular experiments. In this way the bright student never gets far ahead of the class, and the dull one may substitute an experiment he is interested in for one he has trouble to understand. Under this head I put such experiments as the spherometer, Young's modulus of elasticity, the levers of the second and third class, gas pressure and water pressure in the city mains, the water motor, coefficient of expansion of air, heat of fusion, heat of vaporization, specific heat, the efficiency of an alcohol lamp, the horse-power of a small steam engine, the construction of a telegraph line, the construction and operation of a telephone line, the electric bell, the motor, the printing of the magnetic field, etc. This list varies each year to suit the temperament of the students.

Excursions may be made profitable, if well planned, and the class is handled in small groups. If, however, the class has nothing definite as to what is to be seen and studied, the instructor will do well to stay at home with his flock.

DEPARTMENT OF PUBLIC SPEAKING

F. M. BLANCHARD

About twenty-five teachers and principals were in attendance at the conference held by the Department of Public Speaking. Great interest was shown in the discussion of the annual contest, and the general subject "Oral Expression in the Secondary Schools."

It was the opinion of all present that in the future more care should be exercised in securing uniformity in the selections presented at the annual contest. It was agreed that the young women should all give standard poetry, and the young men, oratorical prose. It was requested that the Department of Public Speaking of the University of Chicago send to all competing schools notice of these restrictions, together with a list of authors from whose works selections might properly be taken. The Department of Public Speaking agreed to do this at an early date, in order that the best possible results might be expected from the next contest.